

## ABSTRACT OF THE INVENTION

The present invention provides an isolated archael and bacterial heme binding  
5 protein which reversibly binds oxygen with a low affinity. The heme binding protein  
may be utilized as a blood substitute. The invention also provides a method for controlled  
storage of oxygen by contacting a bacterial heme binding protein with oxygen allowing  
the protein to bind and store oxygen. The also provides methods to sense gaseous ligands  
using the heme binding protein. In other embodiments, the invention provides chimeric  
10 proteins having a heme-binding domain of an isolated heme binding archael bacterial  
protein and a heterologous signaling domain.

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